Blood from stem cells?

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Blood has been among the most sought after and hardest to achieve tissue that CIRM grantees are attempting to derive from embryonic stem cells. It's an obvious target. The medical system needs a constant influx of blood, which comes entirely from volunteer donors. Creating that blood in an unlimited supply from human embryonic stem cells would significantly ease concerns about blood shortages at hospitals. We blogged about a Los Angeles Times story last January that discussed the value of this type of work.

The National Blood Data Resource Center has this to say about how much blood was used in 2001:

> U.S. hospitals transfused nearly 14 million units of whole blood and red blood cells to 4.9 million patients in 2001 - that's an average of 38,000 units of blood needed on any given day.

Given those needs, the findings in a *Nature* paper by CIRM grantee David Traver at the University of California, San Diego could prove helpful. He and his team have discovered a gene called Wnt16 that, in the lab animal zebrafish, is key to the animal eventually developing a pool of hematopoietic stem cells, which are the source of all blood in the body.

In a press release from UCSD Traver said:

> "What we need is the ability to generate self-renewing [human embryonic stem cells] from patients for treatments. But accomplishing this goal means first understanding the mechanisms involved in creating HSCs during embryonic development."

Traver's work follow that of another CIRM grantee Inder Verma of the Salk Institute, who last month published a protocol for creating blood-forming progenitor cells from human embryonic stem cells and reprogrammed iPS cells. Discussing this work in his monthly stem cell research update, CIRM President Alan Trounson wrote:

> Many more cancer and blood disorder patients could benefit from stem cell transplants if large numbers of blood forming stem cells could be grown in the laboratory. Because mature hematopoietic stem cells (HSCs) don't expand well in culture, researchers have been trying to grow these cells from pluripotent stem cells, both embryonic stem cells and reprogrammed iPS cells. Most of these attempts have generated very low numbers of bone marrow colonizing blood precursors, and none have shown robust generation of transplantable HSCs. Now, Verma's team has shown that with five iPS cells lines and two embryonic lines that they can efficiently generate precursors and progenitors of HSCs.

This work brings up another point often made by CIRM grantee Paul Knoepfler at the University of California, Davis. In his blog Knoepfler has argued that supporting stem cell research is a matter of national security. Soldiers wounded on the battlefield need a source of blood for transfusions. Knoepfler wrote in his Sacramento Bee Op-Ed:

> I hope that in the future stem cell research can perhaps slightly lessen the burden on our servicepeople and their families through technologies to save the lives of wounded soldiers.

Nature, June 9, 2011

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